इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 15583 (2005): Compressed Helium Gas [CHD 6: Industrial Gases]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

भारतीय मानक

संपीड़ित हीलियम गैस — विशिष्टि

Indian Standard

COMPRESSED HELIUM GAS — SPECIFICATION

ICS 71.100.20

© BIS 2005

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

May 2005

Price Group 3

Industrial Gases Sectional Committee, CHD 6

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Industrial Gases Sectional Committee had been approved by the Chemical Division Council.

Helium gas falls under the category of speciality gases and is a highly inert gas, usually referred to as the noble gas. Helium is a rare gas and consequently its manufacturers/suppliers are few and users limited. The gas being highly inert, the main criteria is its purity and in some cases, the balance impurities.

The composition of the Committee responsible for the formulation of this standard is given at Annex D.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard
COMPRESSED HELIUM GAS — SPECIFICATION

1 SCOPE

This standard prescribes requirements, methods of sampling and test for helium gas for industrial use.

2 REFERENCES

The following standards listed below contain provisions which through reference in this text, constitute provisions of this Indian Standard. At the time of publication, the editions indicated were valid. All standards are subject to revisions, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1260 (Part 1) : 1973	Pictorial marking for handling and labelling of goods: Part 1 Dangerous goods (*first revision*)
4905 : 1968	Methods for random sampling
7062 : 1973	Glossary of terms used in gas industry

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 7062 shall apply.

4 GRADES

The material shall be of the following six grades depending upon the percent purity of helium:

Grade	*Purity of Helium (Percent, Min)*	*Designation*
I	99	Helium 2.0
II	99.8	Helium 2.8
III	99.99	Helium 4.0
IV	99.995	Helium 4.5
V	99.997	Helium 4.7
VI	99.999	Helium 5.0

5 REQUIREMENTS

5.1 Compressed helium shall be a colourless, odourless gas and shall consist essentially of helium. For the guidance of the users, a technical data sheet prescribing general information for all the above grades of helium is provided in Annex A.

5.2 When tested in accordance with the methods prescribed in Annex B, the material shall also comply with the requirements given in Table 1. Reference to the relevant clauses of Annex B is given in col 9 of the Table 1.

6 PACKING

The gas shall be supplied compressed in cylinders. The design of cylinders, pressure of gas in cylinders and packing and transport shall be in accordance with the *Gas Cylinder Rules*, 1981, of the Government of India, with such modifications as may be ordered from time to time by the Chief Controller of Explosives, Government of India, or any other duly constituted authority.

7 MARKING

7.1 The marking, painting and labelling of cylinders shall be in accordance with the *Gas Cylinder Rules*, 1981, with such modifications as may be issued from time to time by the Chief Controller of Explosives, Government of India, or any other duly constituted authority. The grade of the gas shall be stencilled on the cylinder. The cylinder shall also be marked with the appropriate symbol as prescribed in IS 1260 (Part 1).

7.2 BIS Certification Marking

The cylinders may also be marked with the Standard Mark.

7.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Stanadrds Act*, 1986 and Rules and Regulations made thereunder. The details of conditions under which the licence for use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

8 SAMPLING

Representative samples of the gas shall be drawn and adjudged as prescribed in Annex C.

Table 1 Requirements for Compressed Helium

(*Clause* 5.2)

Sl No.	Characteristic	Requirements/Grades						Method of Test, Ref to Clause
		I	II	III	IV	V	VI	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Assay (*v/v*), percent, *Min*	99	99.8	99.99	99.995	99.997	99.999	B-2
ii)	Water(*v/v*), ppm, *Max*	5	5	3	2	2	1	B-3
iii)	Total hydro-carbon (*v/v*), ppm, *Max*	–	–	–	1	1	1	B-4
iv)	Oxygen(*v/v*), ppm, *Max*	10	10	5	3	3	1	B-5
v)	Nitrogen(*v/v*), ppm, *Max*	20	20	15	10	5	5	B-6
vi)	Hydrogen(*v/v*), ppm, *Max*	–	–	–	–	1	1	B-7
vii)	Carbon monoxide(*v/v*), ppm, *Max*	10	–	–	–	–	–	B-8
viii)	Neon (*v/v*), ppm, *Max*	–	–	–	5	2	1	B-9
ix)	Argon (*v/v*), ppm, *Max*	–	–	–	–	1	1	B-10

ANNEX A

(*Clause* 5.1)

TECHNICAL DATA SHEET FOR HELIUM

A-1 TECHNICAL DATA

A-1.1 Atomic Weight — 3.02 atomic mass units (amu).

A-1.2 Boiling Point — (–)269.96°C (1 atm) (for liquid helium).

A-1.3 Specific Volume — 8.04 m^3/kg at 20°C, 760 mm Hg.

A-1.4 Critical Temperature — 269.82°C (for liquid helium).

A-1.5 Critical Pressure — 1.165 bar abs (885.4 mm Hg).

A-1.6 Heat Capacity — 2 675 J/kg K (2K, 760 mm Hg).

A-1.7 Flammable Limits in Air — Non-flammable.

A-1.8 Toxicity — Not established (considered non-toxic).

A-2 COMPATIBILITY

Compressed helium gas is compatible with all metals and plastics.

A-3 TYPICAL APPLICATIONS

Typical applications of compressed helium gas include dilution/helium – 3 refrigerators, neutron detectors, gas lasers, and ion source.

ANNEX B

(*Clause* 5.2 and *Table* 1)

METHODS OF TEST FOR COMPRESSED HELIUM GAS

B-1 GENERAL

Instrumental methods have been prescribed for determination of impurities in compressed helium gas. Since the limits of impurities are of the order of ppm level, the instrumental methods of analysis are to be adopted for routine analysis.

B-2 DETERMINATION OF HELIUM

B-2.1 Gas Chromatographic Method

B-2.1.1 *Principle*

Chromatography is a process of separation achieved by means of a partition between a stationary phase and a moving phase. A suitable synthetic zeolite and suitable detector are used in Chromatography.

NOTE — When the accuracy of analysis is to be achieved at the level of 1 vpm, the results obtained are always relative to the impurities of carrier gas and are not absolute values. Hence, the ultra high purity gas, that is, Grade V Helium is to be purified further by a suitable rare gas purifier to achieve zero impurity carrier gas. The purifier system consists of titanium granuals at 700°C for removal of nitrogen and oxygen, a copper oxide furnace for removal of hydrogen and carbon monoxide removal and molecular sieve to remove carbon dioxide and moisture.

B-2.1.2 *Apparatus*

The construction of the gas chromatograph is the same as that of any gas chromatograph with a gas sampling value and a loop of known volume. The column material is molecular sieve 5A filled in stainless steel column of 4 m length and 4.6 mm internal diameter. The column is regenerated at 250°C in a stream of helium for about 4 h.

B-2.1.3 *Procedure*

Calibrate the instrument against calibration gas of known composition by measuring the peak heights or areas under various peaks of the chromatograph following the instructions of the manufacturer. Carryout the test according to the manufacturer's instructions and compute the concentration of the various impurities by comparing the peaks or the areas under peaks with that of the calibration gas.

B-3 DETERMINATION OF WATER VAPOUR

B-3.1 General

Four methods have been prescribed, namely, electrolytic hygrometer, frost or dew point hygrometer, capacitance hygrometer and infrared analyzer.

B-3.1.1 *Electrolytic Hygrometer*

The instrument is based on the absorption and electrolysis of the water vapour present in the sample gas. The electrolysis current gives a direct measurement of the water vapour present in the gas flowing through the instrument at a steady rate. The procedure to be followed for determining the moisture content shall depend on the type of apparatus to be used. The manufacturer's instructions in this regard shall be followed.

B-3.1.2 *Frost or Dew Point Hygrometer*

A metal surface on the hygrometer is cooled so that dew or frost is formed from the moisture content of the gas at a particular pressure which may be observed optically in the apparatus. The temperature at which the dew or frost is formed is a measure of moisture content of the gas. The procedure to be followed for determining the moisture content shall depend upon the type of the apparatus to be used. The manufacturer's instructions in this regard shall be followed.

B-3.1.3 *Capacitance Hygrometer*

The instrument is based on the change of capacitance of the sensor when a sample gas containing water vapour passes through it. The change in capacitance gives a direct measurement of water vapour present in the gas. The procedure to be followed for determining the moisture content shall depend upon the type of the apparatus to be used. The manufacturer's instructions in this regard shall be followed.

B-3.1.4 *Infra-Red Analyzer*

Infra-red analysis can be used to estimate the moisture content in the gas. The procedure to be adopted for the determination is to be followed as per the manufacturer's instructions.

B-4 DETERMINATION OF HYDROCARBONS

B-4.0 General

Three methods have been prescribed, namely, gas chromatograph method, infra-red analyzer, and total hydrocarbon analyzer.

B-4.1 Gas Chromatograph Method

B-4.1.1 *Gas Chromatograph*

Chromatograph is a process of separation achieved by means of a partition between a stationary phase and a moving phase. A suitable synthetic zeolite and suitable detector are used in the chromatograph. It should be capable of analyzing various impurities up to 1 vpm (ppm by volume).

B-4.1.2 *Procedure*

Calibrate the instrument against calibration gas of known composition by measuring the peaks or the areas under various peaks of the chromatogram, following the instructions of the manufacturer. Carry out the test according to manufacturer's instructions and compute the concentration of various impurities by comparing the peaks or the areas under peaks with that of calibration gas.

B-4.2 Infra-Red Analyzer

The infra-red analyzers are used for determining impurities of hetroatomic gases. The hetroatomic gases absorb energy at characteristic wavelengths when subjected to infra-red radiation. The procedure to be followed for determining the impurities contents shall depend on the type of apparatus to be used. Manufacturer's instructions in this regard shall be followed.

B-4.3 Total Hydrocarbon Analyzer

B-4.3.1 The sample gas containing hydrocarbon impurities is burnt in a jet of hydrocarbon in the flame ionization detector and the organic components present in the sample gas provide the source of ions. Concentration of ions is proportional to the concentration of organic components. Electrodes having considerable potential difference between them are used to measure the current produced due to ionization and the instrument is calibrated in terms of concentration of hydrocarbons.

B-4.3.2 Calibrate instrument against calibration gas of known concentration of hydrocarbon and perform the test following manufacturer's instructions.

B-5 DETERMINATION OF OXYGEN

B-5.1 General

Three methods have been prescribed, namely, the electrochemical analyzer, the gas chromatograph, and the oxygen analyzer.

B-5.1.1 *Electrochemical Analyzer*

The oxygen in the test gas reacts with silver cathode in galvanic cell contained in the apparatus to produce hydroxyl ions which oxidize metallic cadmium to cadmium hydroxide. This generates a current which flows in the external circuit consisting of a galvanometer connected across the electrodes. The magnitude of the current is a measure of the amount of oxygen in the gas. The procedure to be followed for determination of oxygen content shall depend on the type of the analyzer used. Manufacturers' instructions in this regard shall be followed.

B-5.1.2 *Oxygen Analyzer*

Oxygen analyzer based on zirconium oxide sensing element measures oxygen concentration in nearly all non-combustible gases and gas mixtures in all proportions. It combines the advances of microprocessor technology with trusted cell design. This uses a stabilized zirconium oxide tube, which when hot, acts as an oxygen concentration cell providing an emf proportional to oxygen according to the Nernst equation. The procedure to be followed for determintion of oxygen content shall depend on the type of analyzer used. Manufacturer's instructions in this regard shall be followed.

B-5.1.3 *Gas Chromatograph*

See **B-4.1**.

B-6 DETERMINATION OF NITROGEN

B-6.1 *Gas Chromatograph Method*

B-6.1.1 *Procedure*

Nitrogen shall be determined by gas chromatograph as prescribed in **B-4.1**.

B-7 DETERMINATION OF HYDROGEN

B-7.1 Two methods, namely, the gravimetric method and the volumetric method are prescribed. In case of dispute, gravimetric method shall be considered as the referee method.

B-7.2 Gas Chromatograph Method

B-7.2.1 *Procedure*

Hydrogen shall be determined by gas chromatograph as prescribed in **B-4.1**.

B-8 DETERMINATION OF CARBON MONOXIDE

B-8.1 Instrumental Method

Three methods have been prescribed, namely, the gas chromatography method, infra-red analyzer and the electrochemical method.

B-8.1.1 *Gas Chromatograph*

The procedure for carrying out the determination shall be the same as prescribed in **B-4.1**.

B-8.1.2 *Infra-Red Analyzer*

The procedure for carrying out the determination shall be the same as prescribed in **B-4.2**.

B-8.1.3 *Electrochemical Method*

The procedure given in **B-8.1.3.1** shall be used for the determination of carbon monoxide, after converting carbon monoxide into carbon dioxide by using a suitable convertor, such as iodine pentoxide.

B-8.1.3.1 *Procedure*

When a gas containing carbon dioxide is passed through a reactive liquid, the electrical conductivity of the liquid changes depending upon the carbon dioxide content. The measurement of the change in electrical conductivity gives a direct measurement of carbon dioxide. The procedures to be followed for determining the carbon dioxide shall depend upon the type of apparatus to be used. The manufacturer's instructions in this regard shall be followed.

B-9 DETERMINATION OF NEON

B-9.1 Gas Chromatograph Method

B-9.1.1 *Procedure*

Neon is determined by gas chromatograph as prescribed in **B-4.1** by using suitable detector— Discharge ionization detector technique.

B-10 DETERMINATION OF ARGON

B-10.1 Gas Chromatograph Method

B-10.1.1 *Procedure*

Argon is determined by gas chromatograph as prescribed in **B-4.1** by using suitable detector— Discharge ionization detector technique.

ANNEX C

(*Clause* 8)

SAMPLING OF COMPRESSED HELIUM

C-1 SCALE OF SAMPLING

C-1.1 Lot

In any consignment, all cylinders charged at a time from one charging manifold shall constitute a lot.

C-1.2 The number of cylinders (*n*) to be selected from a lot shall depend on the size of the lot (*N*) and shall be in accordance with col 2 of Table 2.

C-1.2.1 The cylinders shall be selected at random and in order to ensure the randomness of selection, a random number table (*see* IS 4905) shall be used. In case such a table is not available, the following procedure should be followed:

Starting from any cylinder in the lot, count them in one order as 1,2,3 ...... up to *r* and so on, where *r* is the integral part of *N/n*. Every *r*th cylinder thus counted shall be withdrawn to give the sample for test.

C-2 TEST SAMPLES

A sample of gas shall be drawn from each cylinder selected as in **C-1.2** and shall be the individual test sample from each cylinder.

C-3 NUMBER OF TESTS

All the individual test samples from each lot prepared as in **C-2** shall be tested separately for all the requirements given in Table 1.

C-4 CRITERIA FOR CONFORMITY

A lot shall be declared as conforming to the requirements of the specification if all individual samples tested pass the requirements prescribed in **5**.

Table 2 Number of Cylinders to be Selected

(*Clause* C-1.2)

Sl No.	Lot Size *N*	Number of Cylinder to be Selected *n*
(1)	(2)	(3)
i)	Up to 50	5
ii)	51 to 100	8
iii)	101 to 150	15
iv)	151 to 300	20
v)	301 and above	25

ANNEX D

(Foreword)

COMMITTEE COMPOSITION

Industrial Gases Sectional Committee, CHD 6

Organization	*Representative(s)*
Praxair India Pvt Ltd, Bangalore	Shri R. S. Dhulkhed (***Chairman***)
All India Industrial Gases Manufacturer's Association, New Delhi	Dr P. L. Bhatia Shri B. N.Qanungo (*Alternate*)
Bharat Heavy Electricals Ltd, Hyderabad	Shri N. V. S. Ramani Shri A. Rajamohan (*Alternate*)
Central Electronics Ltd, Ghaziabad	Shri M. I. Alam
Department of Electronics, New Delhi	Dr U. C. Pandey
Department of Industrial Development, New Delhi	Shri P. K. Jain Shri N. C. Tiwari (*Alternate*)
Gujarat State Fertilizer Corporation Ltd, Vadodara	Shri M. C. Shah Shri R. C. Mathur (*Alternate*)
BOC India Ltd, Kolkata	Shri P. Amarnath
Industrial Oxygen Co Ltd, Mumbai	Shri R. R. Singanporia
Sylvania & Laxman Ltd, New Delhi	Shri S. K. Kapoor Shri Naveen Sikka (*Alternate*)
M/s Mohan Meakin Ltd, Ghaziabad	Dr E. K. Jayanarayanan
Ministry of Defence (DGQA), Kanpur	Shri Y. V. Vailure Shri Sujit Ghosh (*Alternate*)
National Test House, Kolkata	Dr B. B. Pal
Rashtriya Chemicals and Fertilizers Ltd, Mumbai	Dr R. N. Trivedi
Steel Authority of India, New Delhi	Shri A. Nagarajan Shri S. G. K. Murthy (*Alternate*)
The Asiatic Oxygen and Acetylene Co Ltd, Kolkata	Shri B. N. Sinha
The Industrial Gases Ltd, Kolkata	Shri T. Garg Shri L. R. Garg (*Alternate)*
Indian Space Research Organization, Shriharikota	Representative
Ordnance Factory, Bhandara	Dr S. K. Deshmukh Shri V. Srinivasan (*Alternate*)
Chief Controller of Explosives, Nagpur	Shri R. H. Bhalekar Shri S. K. Bhardwaj (*Alternate*)
Semi Conductor Complex Ltd, Punjab	Shri S. S. N. Prasad
Mahalasa Gases & Chemicals Pvt Ltd, Bangalore	Shri A. N. Prabhu Prof M. G. Subba Rao (*Alternate*)
Steel Furnace Association of India, Surat	Shri M. K. Gupta
National Physical Laboratory, New Delhi	Representative
Association of Automobiles Manufacturers of India, New Delhi	Representative
Everest Kanto, Mumbai	Representative
BIS Directorate General	Dr U. C. Srivastava, Director & Head (Chem) [Representing Director General (*Ex-officio*)]

Member Secretary
Shri P. Ghosh
Director (Chem), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc: No. CHD 6 (259).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *website* : www.bis.org.in

Regional Offices:		Telephones
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	2323 7617 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi KOLKATA 700054	2337 8499, 2337 8561 2337 8626, 2337 9120
Northern	: SCO 335-336, Sector 34-A, CHANDIGARH 160022	260 3843 260 9285
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600113	2254 1216, 2254 1442 2254 2519, 2254 2315
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	2832 9295, 2832 7858 2832 7891, 2832 7892

Branches : AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. NALAGARH. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM. VISAKHAPATNAM.

Printed at Simco Printing Press, Delhi

AMENDMENT NO. 1 DECEMBER 2008
TO
IS 15583 : 2005 COMPRESSED HELIUM GAS — SPECIFICATION

(*Page* 5, *Annex* C, *Table* 2) — Substitute the following for the existing:

Table 2 Number of Cylinders to be Selected
(*Clause* C-1.2)

Lot Size N (1)	Number of Cylinders to be Selected n (2)
Up to 25	3
26 to 50	5
51 to 100	8
101 to 200	15
201 to 300	20
301 and above	25

(CHD 6)

Reprography Unit, BIS, New Delhi, India